ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Innovative Bi-Directional Windmill, Parabolic Solare Termica and Magnetic Levitated Wind Mill in a Hybrid Renewable Energy Model with Extension

J.Gopi Krishnan
Department of EEE,
CMR College of Engineering and Technology,
Medchal road, Hyderabad.

K.Soujanya
Professor,
Department of EEE,
CMR College of Engineering and Technology,
Medchal road, Hyderabad.

Abstract

Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human time scale such as sunlight, wind. So we are developing a new kind of architecture to get more efficiency than comparable existing methods. This smart production is employed in several places like ships, remote islands, buildings and hilly areas.

Wind energy is the energy extracted from wind using wind turbines to produce electrical power, windmills for mechanical power, wind pumps for water pumping, or sails to propel ships. The wind turbine is characterized in that an impeller is welded by a multilevel cymbiform blade and disc-shaped protecting sheets at two sides and a rotating wheel drawing group.

Introduction

Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind. So we are developing new kind of architecture to get more efficiency comparatively existing methods.

This project is a design of three combination technology bi-direction wind, solare termica and Magnetic levitated Wind Turbine. Wind power or wind energy is the energy extracted from wind using wind turbines to produce electrical power, windmills for mechanical power, wind pumps for water pumping, or sails to propel ships. Wind power, as an alternative to fossil fuels, is plentiful, renewable, widely distributed, clean, integrates Exterior Design, Practical design, Electrical Engineering, Power Mechanics, Aviation atmosphere engineering, Wind Tunnel Testing, Magnetic Levitation Theory with Computer Simulation of Fractional, adopting the magnetic levitation theory-when there is no mechanical friction with the motor, under the push of wind, makes the motor rotate smoothly and stably. So the wind turbine minimum rotating wind speed achieves 1m/s.

The practical application of the maglev wind turbine is as follows: Power supply for ships Electricity for Agriculture and Fishery Landscape education of wind energy and electricity Wind-hydraulic generation system Public electricity supply for building Remote area Independent house Correspondence base Street light Electricity supply for community Traffic signals Independent Military Island Scaled prototype of a ring propeller hydrokinetic turbine. The invention discloses a secondary jet impulse water turbine. The water turbine is characterized in that an impeller is welded by a multi-level cymbiform blade and disc-shaped protecting sheets at two sides and a rotating wheel drawing group This article offers an illustrated description of a method to produce a closed parabola trough solar energy collector box based on the elasticity of the material. What is described here is basically a manual method to make high efficiency solar collectors against very low cost, which is particularly suited for teaching, research or demonstration purposes. But it is hard for a manually made collector to match the efficiency, lifetime and water tightness standard of an industrial product using the same method. It will also cost more than the industrial collector.

HISTORY

Wind power has been used as long as humans have put sails into the wind. For more than two millennia wind-powered machines have ground grain and pumped water. Wind power was widely available and not confined to the banks of fast-flowing streams, or later, requiring sources of fuel. Wind-powered pumps drained the polders of the Netherlands, and in arid regions such as the American mid-west or the Australian outback, wind pumps provided water for livestock and steam engines.

The first windmill used for the production of electricity was built in Scotland in July 1887 by Prof James Blyth of Anderson's College, Glasgow. Blyth's 10 m high, cloth-sailed wind turbine was installed in the garden of his holiday cottage at Mary Kirk in Kincardineshire and was used to charge accumulators developed by the Frenchman Camille Alphonse Faure, to power the lighting in the cottage, thus making it the first house in the world to have its electricity supplied by wind power. Blyth offered the surplus electricity to the people of Mary Kirk for lighting the main street, however, they turned down the offer as they thought electricity was “the work of the devil”. Although he later built a wind turbine to supply emergency power to the local Lunatic Asylum, Infirmary and Dispensary of Montrose the invention never really caught on as the technology was not considered to be economically viable.

Across the Atlantic, in Cleveland, Ohio a larger and heavily engineered machine was designed and constructed in the winter of 1887-1888 by Charles F. Brush, this was built by his engineering company at his home and operated from 1886 until 1900. The Brush wind turbine had a rotor 17 m (56 foot) in diameter and was mounted on an 18 m (60 foot) tower. Although large by today's standards, the machine was only rated at 12 kW. The connected dynamo was used either to charge a bank of batteries or to operate up to 100 incandescent light bulbs, three arc lamps, and various motors in Brush's laboratory.

Professor Giovanni Francia (1911–1980) designed and built the first concentrated-solar plant, which entered into operation in Sant'Ilario, near Genoa, Italy in 1968. This plant had the architecture of today's concentrated-solar plants with a solar receiver in the center of a field of solar collectors. The plant was able to produce 1 MW with superheated steam at 100 bar and 500 °C. The 10 MW Solar One power tower was developed in Southern California in 1981, but the parabolic-trough technology of the nearby Solar Energy Generating Systems (SEGS), begun in 1984, was more workable. The 354 MW SEGS is still the largest solar power plant in the world, and will remain so until the 390 MW Ivanpah power tower project comes online.

IMPLEMNETATION OF HARDWARE:

This chapter explanation all kind of component and working principle, this project is implementation of two technologies. Used to generate electricity bi-directional wind and solar panel, bi-directional wind turbine is the popular name for a device that converts kinetic energy from the wind into electrical power. Technically there is no turbine used in the design but the term appears to have migrated from parallel hydroelectric technology. The correct description for this type of machine would be aerofoil-powered generator. A wind turbine used for charging batteries may be referred to as a wind charger. Solar energy is radiant light and heat from the sun harnessed using a range of ever-evolving technologies such as solar heating, solar photovoltaic, solar thermal energy, solar architecture and artificial photosynthesis.

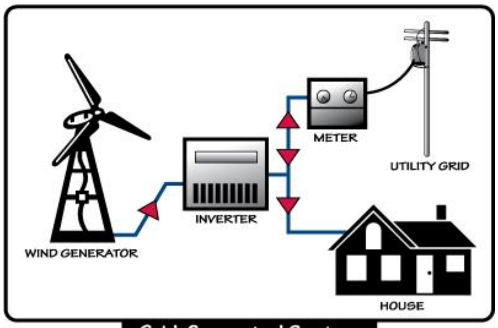
Block Diagram:

- This project block diagram using modules
- Bi-directional wind turbine,
- Solar panel module,
- Solare termica
- Dynamo
- Battery
- Magnetic levitated wind turbine
- Boosting converter

Bi-directional wind turbine: Wind power converts the kinetic energy in wind to generate electricity or mechanical power. This is done by using a large wind turbine usually consisting of propellers; the turbine can

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

be connected to a generator to generate electricity, or the wind used as mechanical power to perform tasks such as pumping water or grinding grain. As the wind passes the turbines it moves the blades, which spins the shaft.



Grid-Connected System

There are currently two different kinds of wind turbines in use, the Horizontal Axis Wind Turbines (HAWT) or the Vertical Axis Wind Turbines (VAWT). HAWT are the most common wind turbines, displaying the propeller or 'fan-style' blades and VAWT are usually in an 'egg-beater' style.

- Bi-directional wind turbine is one of the Vertical-axis wind turbines (or VAWTs) have the main rotor shaft arranged vertically. One advantage of this arrangement is that the turbine does not need to be pointed into the wind to be effective, which is an advantage on a site where the wind direction is highly variable. Also, the generator and gearbox can be placed near the ground, using a direct drive from the rotor assembly to the ground-based gearbox, improving accessibility for maintenance.
- The key disadvantages include the relatively low rotational speed with the consequential higher torque and hence higher cost of the drive train, the inherently lower power coefficient, the 360 degree rotation of the aerofoil within the wind flow during each cycle and hence the highly dynamic loading on the blade, the pulsating torque generated by some rotor designs on the drive train, and the difficulty of modelling the wind flow accurately and hence the challenges of analyzing and designing the rotor prior to fabricating a prototype.
- When a turbine is mounted on a rooftop the building generally redirects wind over the roof and this can double the wind speed at the turbine. If the height of a rooftop mounted turbine tower is approximately 50% of the building height it is near the optimum for maximum wind energy and minimum wind turbulence. Wind speeds within the built environment are generally much lower than at exposed rural sites, noise may be a concern and an existing structure may not adequately resist the additional stress.

Creating Electricity from Wind:

To create electricity from wind the shaft of the turbine must be connected to a generator. The generator uses the turning motion of the shaft to rotate a rotor which has oppositely charge magnets and is surrounded by copper wire loops. Electromagnetic induction is created by the rotor spinning around the inside of the core, generating electricity.

Distribution of Electricity:

The electricity generated by harnessing the wind's mechanical energy must go through a transformer in order increase its voltage and make it successfully transfer across long distances. Power stations and fuse boxes receive the current and then transform it to a lower voltage that can be safely used by business and homes.

Renewable Energy:

Wind energy in itself is a source of renewable energy which means it can be produced again and again since it is available in plenty. It is cleanest form of renewable energy and is currently used many leading developed and developing nations to fulfill their demand for electricity.

Reduces Fossil Fuels Consumption:

Dependence on the fossil fuels could be reduced to much extent if it is adopted on the much wider scale by all the countries across the globe. It could be answer to the ever increasing demand for petroleum and gas products.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Apart from this, it can also help to curb harmful gas emissions which are the major source of global warming.

Less Air and Water Pollution:

Wind energy doesn't pollute at all. It is that form of energy that will exist till the time sun exists. It does not destroy the environment or release toxic gases. Wind turbines are mostly found in coastal areas, open plain and gaps in mountains where the wind is reliable, strong and steady. An ideal location would have a near constant flow of non-turbulent wind throughout the year, with a minimum likelihood of sudden powerful bursts of wind.

Initial Cost:

The cost of producing wind energy has come down steadily over the last few years. The main cost is the installation of wind turbines. Moreover the land used to install wind turbines can also be used for agriculture purpose. Also, when combine with solar power, it provides cheap, reliable, steady and great source of energy for the developed and developing countries.

Efficiency:

Not all the energy of blowing wind can be harvested, since conservation of mass requires that as much mass of air exits the turbine as enters it. Betz's law gives the maximal achievable extraction of wind power by a wind turbine as 59% of the total kinetic energy of the air flowing through the turbine.

Further inefficiencies, such as rotor blade friction and drag, gearbox losses, generator and converter losses, reduce the power delivered by a wind turbine. Commercial utility-connected. Turbines deliver 75% to 80% of the Betz limit of power extractable from the wind, at rated operating speed.

Efficiency can decrease slightly over time due to wear. Analysis of 3128 wind turbines older than 10 years in Denmark showed that half of the turbines had no decrease, while the other half saw a production decrease of 1.2% per year.

The three primary types:

1. HAWT towered,
2. VAWT Savories,
3. VAWT Darrius.

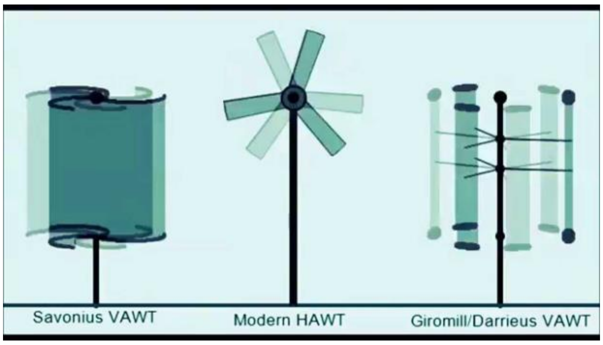


Fig. 3.1 types wind turbines

Wind turbines can rotate about either a horizontal or a vertical axis, the former being both older and more common.

Horizontal-axis wind turbines (HAWT) have the main rotor shaft and electrical generator at the top of a tower, and must be pointed into the wind. Small turbines are pointed by a simple wind vane, while large turbines generally use a wind sensor coupled with a servo motor. Most have a gearbox, which turns the slow rotation of the blades into a quicker rotation that is more suitable to drive an electrical generator.

Since a tower produces turbulence behind it, the turbine is usually positioned upwind of its supporting tower. Turbine blades are made stiff to prevent the blades from being pushed into the tower by high winds. Additionally, the blades are placed a considerable distance in front of the tower and are sometimes tilted forward into the wind a small amount.

Downwind machines have been built, despite the problem of turbulence (mast wake), because they don't need an additional mechanism for keeping them in line with the wind, and because in high winds the blades can be allowed to bend which reduces their swept area and thus their wind resistance. Since cyclical (that is repetitive) turbulence may lead to fatigue failures, most HAWTs are of upwind design.

Turbines used in wind farms for commercial production of electric power are usually three-bladed and pointed into the wind by computer-controlled motors. These have high tip speeds of over 320 km/h (200 mph), high efficiency, and low torque ripple, which contribute to good reliability. The blades are usually colored white for daytime visibility by aircraft and range in length from 20 to 40 meters (66 to 131 ft) or more. The tubular steel towers range from 60 to 90 meters (200 to 300 ft) tall. The blades rotate at 10 to 22 revolutions per minute. At 22 rotations per minute the tip speed exceeds 90 meters per second (300 ft/s).[20][21] A gear box is commonly used for stepping up the speed of the generator, although designs may also use direct drive of an annular generator. Some models operate at constant speed, but more energy can be collected by variable-speed turbines which use a solid-state power converter to interface to the transmission system. All turbines are equipped with protective features to avoid damage at high wind speeds, by feathering the blades into the wind which ceases their rotation, supplemented by brakes.

Vertical axis design:

A vertical axis Twisted Savonius type turbine:

Vertical-axis wind turbines (or VAWTs) have the main rotor shaft arranged vertically. One advantage of this arrangement is that the turbine does not need to be pointed into the wind to be effective, which is an advantage on a site where the wind direction is highly variable. It is also an advantage when the turbine is integrated into a building because it is inherently less steerable. Also, the generator and gearbox can be placed near the ground, using a direct drive from the rotor assembly to the ground-based gearbox, improving accessibility for maintenance.

The key disadvantages include the relatively low rotational speed with the consequential higher torque and hence higher cost of the drive train, the inherently lower power coefficient, the 360 degree rotation of the aerofoil within the wind flow during each cycle and hence the highly dynamic loading on the blade, the pulsating torque generated by some rotor designs on the drive train, and the difficulty of modeling the wind flow accurately and hence the challenges of analyzing and designing the rotor prior to fabricating a prototype.

When a turbine is mounted on a rooftop the building generally redirects wind over the roof and this can double the wind speed at the turbine. If the height of a rooftop mounted turbine. tower is approximately 50% of the building height it is near the optimum for maximum wind energy and minimum wind turbulence.

Savonius wind turbine:

These are drag-type devices with two (or more) scoops that are used in anemometers, Flettner vents (commonly seen on bus and van roofs), and in some high-reliability low-efficiency power turbines. They are always self-starting if there are at least three scoops.

Twisted Savonius:

Twisted Savonius is a modified savonius, with long helical scoops to provide smooth torque. This is often used as a rooftop wind turbine and has even been adapted for ships.

Another type of vertical axis is the Parallel turbine, which is similar to the cross flow fan or centrifugal fan. It uses the ground effect. Vertical axis turbines of this type have been tried for many years: a unit producing 10 kW was built by Israeli wind pioneer Bruce Brill in the 1980s.

Darrieus wind turbine:

"Eggbeater" turbines, or Darrieus turbines, were named after the French inventor, Georges Darrieus. They have good efficiency, but produce large torque ripple and cyclical stress on the tower, which contributes to poor reliability. They also generally require some external power source, or an additional Savonius rotor to start turning, because the starting torque is very low. The torque ripple is reduced by using three or more blades which results in greater solidity of the rotor. Solidity is measured by blade area divided by the rotor area. Newer Darrieus type turbines are not held up by guy-wires but have an external superstructure connected to the top bearing.

Dynamo:

A dynamo is an electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary converter. Today, the simpler alternator dominates large scale power generation, for efficiency.

Photo voltaic:

Photo voltaic (PV) is a method of converting solar energy into direct current electricity using semiconducting materials that exhibit the photovoltaic effect. A photovoltaic system employs solar panels composed of a number of solar cells to supply usable solar power.

Photo voltaic are best known as a method for generating electric power by using solar cells to convert energy from the sun into a flow of electrons. The photo voltaic effect refers to photons of light exciting electrons into a higher state of energy, allowing them to act as charge carriers for an electric current. The photovoltaic effect was first observed by Alexandra-Edmond Becquerel in 1839. The term photovoltaic denotes the unbiased operating mode of a photo diode in which current through the device is entirely due to the transduced light energy. Virtually all photovoltaic devices are some type of photodiode.

Solar cells produce direct current electricity from sun light which can be used to power equipment or to recharge a battery. The first practical application of photo voltaic was to power orbiting satellites and other spacecraft, but today the majority of photovoltaic modules are used for grid connected power generation. In this case an inverter is required to convert the DC to AC.

Phosphorus:

Phosphorus is a chemical element with symbol P and atomic number 15. As an element, phosphorus exists in two major forms—white phosphorus and red phosphorus—but due to its high reactivity, phosphorus is never found as a free element on Earth. Instead phosphorus-containing minerals are almost always present in their maximally oxidised state, as inorganic phosphate rocks.

Boron:

Boron is a chemical element with symbol B and atomic number 5. Because boron is produced entirely by cosmic ray spallation and not by stellar nucleosynthesis, it is a low-abundance element in both the Solar system and the Earth's crust. Boron is concentrated on Earth by the water-solubility of its more common naturally occurring compounds, the borate minerals. These are mined industrially as evaporates , such as reducer of boron minerals.

MAGNETIC LEVITATED WIND TURBINE

In selecting the vertical axis concept for the wind turbine that is implemented as the power generation portion of this project, a certain uniqueness corresponded to it that did not pertain to the other wind turbine designs. The characteristic that set this wind generator apart from the others is that it is fully supported and rotates about a

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

vertical axis. This axis is vertically oriented through the center of the wind sails which allows for a different type of rotational support rather than the conventional ball bearing system found in horizontal wind turbines. This support is called maglev which is based on magnetic levitation. Maglev offers a near frictionless substitute for ball bearings with little to no maintenance.

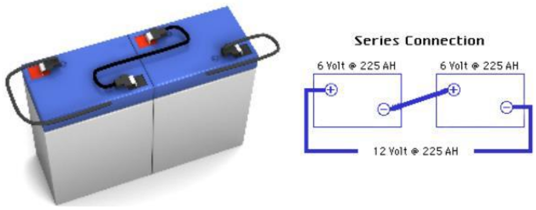
BATTERIES AND BOOSTING CIRCUITS

Batteries:

Batteries are devices that convert stored chemical energy into useful electrical energy. A battery may be thought of as a clever variant of a standard exothermic chemical reactor that yields chemical products with lower energy content than the chemical reactants. In such a chemical reactor, the overall chemical reaction proceeds spontaneously (possibly requiring a catalyst and/or elevated temperature) when the reactants are brought into physical contact. In a battery, the overall chemical reaction is divided into two physically and electrically separated processes: one is an oxidation process at the battery negative electrode wherein the valence of at least one species becomes more positive, and the other is a reduction process at the battery positive electrode wherein the valence of at least one species becomes more negative.

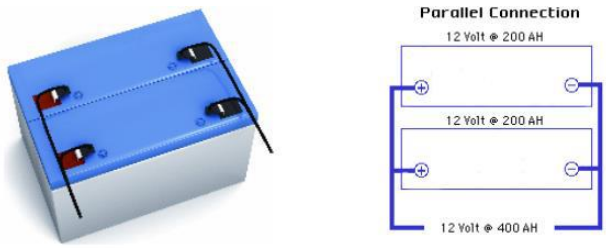
Connecting in Series (Increases Voltage)

In connecting batteries in series the positive terminal of the first battery is connected to the negative terminal of the second battery and so on down the string. The interconnecting cables must be of equal length and resistance to insure equalization of the load. All batteries in the string will receive the same amount of charge current, though individual battery voltages may vary.



Connecting in Parallel (Increases Capacity):

When charging batteries in parallel (positive terminals are connected to the positive terminal and negative terminals to the negative), all batteries in the string will receive the same charge voltage but the charge current each battery receives will vary until equalization is reached.



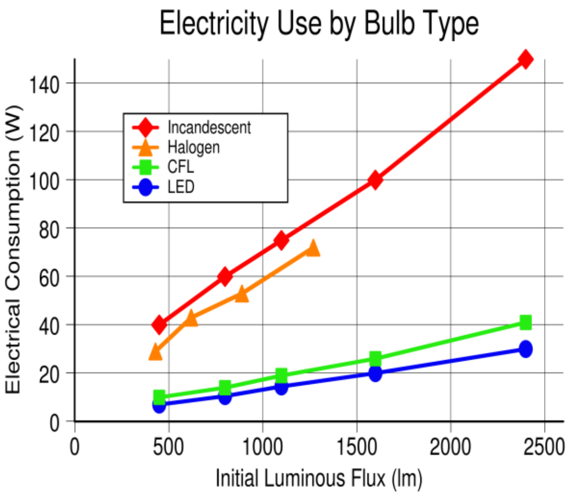
LOAD

6.1 Compact fluorescent lamp (CFL):

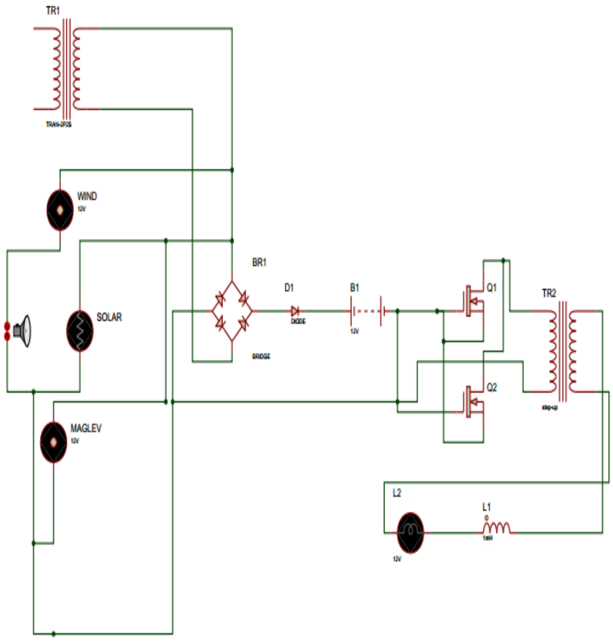
A compact fluorescent lamp (CFL), also called compact fluorescent light, energy-saving light, and compact fluorescent tube, is a fluorescent lamp designed to replace an incandescent lamp; some types fit into light fixtures formerly used for incandescent lamps. The lamps use a tube which is curved or folded to fit into the space of an incandescent bulb, and a compact electronic ballast in the base of the lamp.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Compared to general-service incandescent lamps giving the same amount of visible light, CFLs use one-fifth to one-third the electric power, and last eight to fifteen times longer. A CFL has a higher purchase price than an incandescent lamp, but can save over five times its purchase price in electricity costs over the lamp's lifetime. Like all fluorescent lamps, CFLs contain toxic mercury which complicates their disposal. In many countries, governments have established recycling schemes for CFLs and glass generally.



SCHEMTIC DIAGRAM



OUTPUT:

PARABOLA SOLARE TERMICA

BIDIRECTIONAL WIND TURBINE

The two blades of the bidirectional wind turbine are perpendicular to each other, so that it can rotate to any direction when wind comes

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- The wind is free and with modern technology it can be captured efficiently. Once the wind turbine is built the energy it produces does not cause greenhouse gases or other pollutants.
- Although wind turbines can be very tall each takes up only a small plot of land. This means that the land below can still be used. This is especially the case in agricultural areas as farming can still continue.
- Wind turbines have a role to play in both the developed and third world.
- Wind turbines are available in a range of sizes which means a vast range of people and businesses can use them. Single households to small towns and villages can make good use of range of wind turbines available today.

DISADVANTAGES:

- While this design is less likely to be damaged by gusty wind conditions, they are more likely to stall out and stop spinning.
- These types of turbines aren't typically well suited for use in areas of high wind speeds.
- Due to the vertically oriented blade design, the blades tend to flex and twist as the rotor assembly spins faster and faster. The centrifugal force generated by the spinning blades has been reported to cause stress and fatigue on some blade designs that occasionally results in them breaking.

APPLICATIONS:

- The Wind spire, a small VAWT intended for individual (home or office) use was developed in the early 2000s by US Company Mariah Power. The company reported that several units had been installed across the US by June 2008.
- Arbor wind, an Ann-Arbor (Michigan, US) based company, produces a patented small VAWT which has been installed at several US locations as of 2013.
- In 2011, Sandia National Laboratories wind-energy researchers began a five-year study of applying VAWT design technology to offshore wind farms the researchers stated: "The economics of offshore wind power are different from land-based turbines, due to installation and operational challenges.

CONCLUSION AND FUTURE SCOPE

Our work and the results obtained so far are very encouraging and reinforce the conviction that solare termica and vertical axis wind energy conversion systems are practical and potentially very contributive to the production of clean renewable electricity from the wind even under less than ideal sitting conditions. It is hoped that they may be constructed used high-strength, low weight materials for deployment in more developed nations and settings or with very low tech local materials and local skills in less developed countries. The Savonius wind turbine designed is ideal to be located on top of a bridge or bridges to generate electricity, powered by wind. The elevated altitude gives it an advantage for more wind opportunity. With the idea on top of a bridge, it will power up street lights and or commercial use.

FUTURE DEVELOPMENT:

The development of effective alternators and dynamos can be used to harness wind energy from relatively small winds, solar energy from relatively. The use of materials like Acrylic Plastic Sheets can be used to develop low cost ineptly and a little effort at the side may find an effective solution for the boom of the electrical energy by the society.

REFERENCES

1. Jha, Ph.D., A.R. (2010). Wind turbine technology. Boca Raton, FL: CRC Press

2. Amina El Kasmi, Christian Masson, An extended k-epsilon model for turbulent flow through horizontal-axis wind turbines, Journal of Wind Engineering and Industrial Aerodynamics, Volume 96, Issue 1, January 2008, Pages 103-122, retrieved 2010-04-26

3. Sandra Eriksson, Hans Bernhoff, Mats Leijon, (June 2008), "Evaluation of different turbine concepts for wind power", Renewable and Sustainable Energy Reviews **12** (5): 1419–1434, doi:10.1016/j.rser.2006.05.01, ISSN 1364-0321, retrieved 2010-04-26

4. Steven Peace, Another Approach to Wind, retrieved 2010-04-26

5. Kathy Svitil, Wind-turbine placement produces tenfold power increase, researchers say, retrieved 2012-07-31

6. Chiras, D. (2010). Wind power basics: a green energy guide. Gabriola Island, BC, Canada: New Society Pub.

7. ^ Sutherland, Herbert J; Berg, Dale E, Ashwill, Thomas D. (2012). "A Retrospective of VAWT Technology" (PDF). Sandia National Laboratories. Retrieved 19 September2014.

8. C-NET, "Vertical-axis wind turbine spins into business" (2 June 2008)

9. Arborwind (website), "History"